深圳市勋瑞光电科技有限公司
Xunrui Shenzhen Optoelectronics Technology Co., Ltd.

TFT LCM Approval Sheet

PRODUCT SPECIFICATIONS

MODULE NO: H032PQ37E2505

For Customer: _____

Approved by: _____

Signature: _____

Date: _____

Prepared	Checked	Approved	Date

深圳市勋瑞光电科技有限公司
Xunrui Shenzhen Optoelectronics Technology Co., Ltd.

2007-4-5	01	FIRST ISSUE	Daniel. YU	Daniel. YU	
2007-4-18	02	Modify the viewing angle	Com.W		
2007-7-30	03	Modify the backlight parameters	Com.W		

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CONTENTS

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1. GENERAL SPECIFICATIONS

1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered by SUCCESS ELECTRONIC to Customer。

1-2 PRODUCTS:

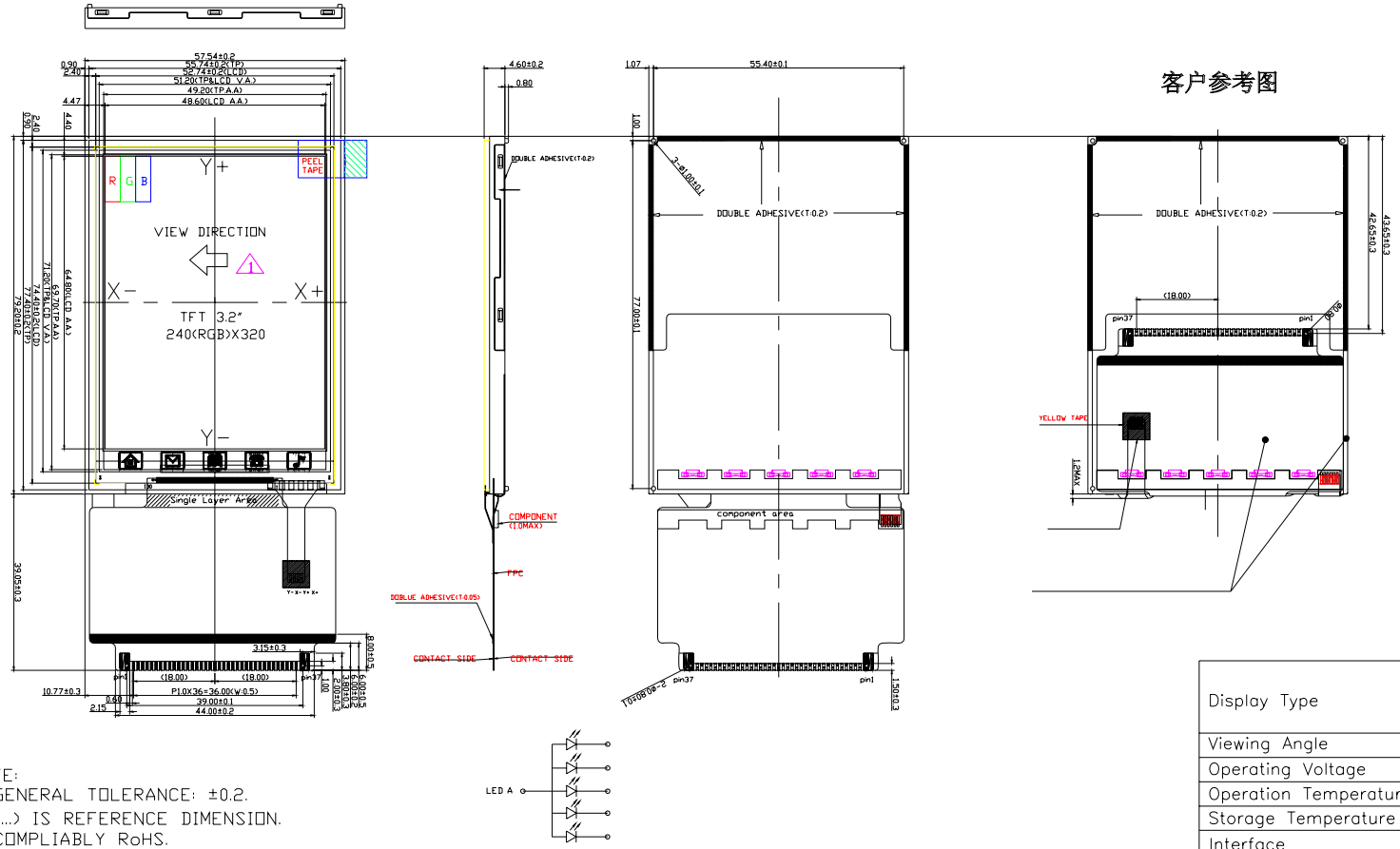
Liquid Crystal Display Module (LCM)

2. FEATURES

(1) Display Type: 3.2"TFT, Transmissive, 3 o'clock,Normal White.
(2) With white LED Backlight
(3) Control IC SSD1289Z

3. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMEMSIONS	57.54(W) x79.2(H) x4.6(T)	mm
ACTIVE AREA	48.6 (W) x64.8(H)	mm
DISP.CONSTRUCTION	240(RGB) x320 Dots	PIXELS
NUMBER OF DOTS	240 x3 x320	Dots
PIXEL PITCH	0.2025X0.2025	mm
ASSY.TYPE	COG+FPC	---
BACKLIGHT	WHITE LED	—
WEIGHT	TBD	g



PIN ASSIGNMENT

1	GND
2	VDD
3	VDD
4	CS
5	RS
6	WR
7	RD
8	REST
9	DBD0
10	DBD1
11	DBD2
12	DBD3
13	DBD4
14	DBD5
15	DBD6
16	DBD7
17	DBD8
18	DBD9
19	DBD10
20	DBD11
21	DBD12
22	DBD13
23	DBD14
24	DBD15
25	GND
26	Y-
27	X-
28	Y+
29	X+
30	LED-1
31	LED-2
32	LED-3
33	LED-4
34	LED-5
35	LED-A
36	LED-A
37	GND

NOTE:
1. GENERAL TOLERANCE: ±0.2.
2. (...) IS REFERENCE DIMENSION.
3. COMPLIABLY RoHS.
4. MAIN LCD DRIVER: SSD1289Z

Display Type	TFT NORMAL WHITE TRANSMISSIVE
Viewing Angle	3 O'CLOCK ⚠1
Operating Voltage	VDD=2.8V
Operation Temperature	-20°C TO 60°C
Storage Temperature	-30°C TO 70°C
Interface	
Backlight Color	WHITE
Backlight Forward Voltage	Vf=3.5V(If=100mA)

VER.	SYMBOL	AMENDMENT	SIGN	DATE
02	⚠1	Viewing Angle 9 O'CLOCK->3 O'CLOCK	LIZHIYI	20070418
01	SYMBOL	first issue		20070203

WN	
ME.CHECKED	
EE.CHECKED	
PE.CHECKED	
APPROVED	
CUSTOMER'S APPROVAL	

TITLE

MODULE SPEC.

DRAWING NO.

H032PQ37E2505

	S95160	VER.	01
UN	mm		FIT
3rd Angle		1	1

深圳市动瑞光电科技有限公司
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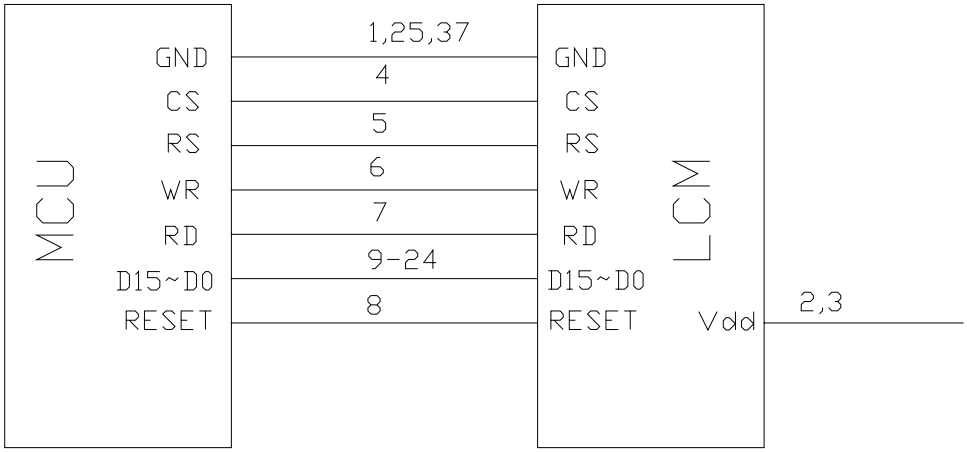
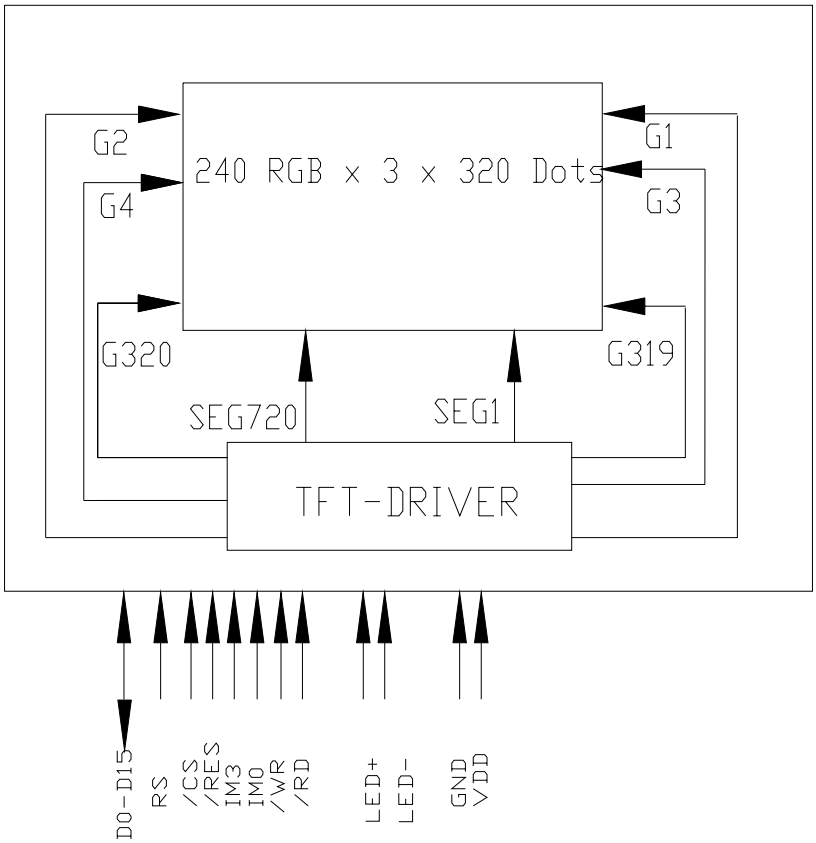
5. INTERFACE ASSIGNMENT

PIN NO.	FUNCTION DESCRIPTIONS	SYMBOL
1	Ground	GND
2	Power supply for analog and logic	VDD
3	Power supply for analog and logic	VDD
4	Chip enable signal , chip can be accessed when it is low	CS
5	The signal for register index (RS=1)or register command(RS=0) select	RS
6	Serves as a write signal and writes data at the rising edge in i80 system interface	WR
7	Serves as a read signal and read data at the low level in i80 system interface	RD
8	Reset pin, can reset the chip at the low level	REST
9	Data bus 0	DBD0
10	Data bus 1	DBD1
11	Data bus 2	DBD2
12	Data bus 3	DBD3
13	Data bus 4	DBD4
14	Data bus 5	DBD5
15	Data bus 6	DBD6
16	Data bus 7	DBD7
17	Data bus 8	DBD8
18	Data bus 9	DBD9
19	Data bus 10	DBD10
20	Data bus 11	DBD11
21	Data bus 12	DBD12
22	Data bus 13	DBD13
23	Data bus 14	DBD14
24	Data bus 15	DBD15
25	Ground	GND
26	Touch panel input pin	Y-
27	Touch panel input pin	X-
28	Touch panel input pin	Y+
29	Touch panel input pin	X+
30	Power supply for LED-	LED-1
31	Power supply for LED-	LED-2
32	Power supply for LED-	LED-3
33	Power supply for LED-	LED-4
34	Power supply for LED-	LED-5
35	Power supply for LED+	LED-A
36	Power supply for LED+	LED-A
37	Ground	GND

6.APPLICATION CUICIRT





7.1 80SYSTEM TIMING CHARACTERISTICS

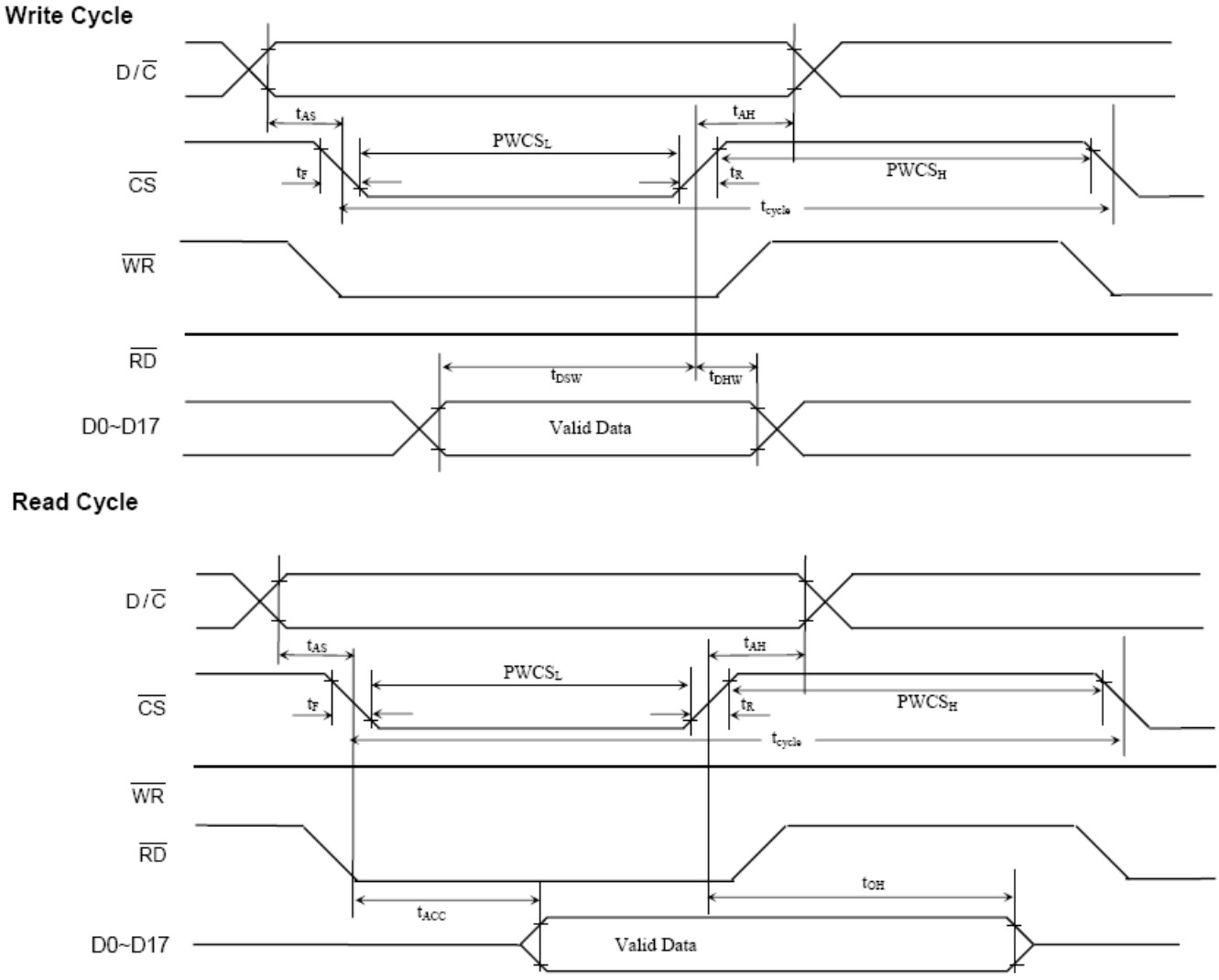


Figure 13-2 –Parallel 8080-series Interface Timing Characteristics

9. DDRAM ARRANGEMENT

	RL=1	S0	S1	S2	S3	S4	S5	S6	S7	S8	…	S714	S715	S716	S717	S718	S719	
	RL=0	S719	S718	S717	S716	S715	S714	S713	S712	S711	…	S5	S4	S3	S2	S1	S0	
	BGR=0	R	G	B	R	G	B	R	G	B	…	R	G	B	R	G	B	Vertical address
	BGR=1	B	G	R	B	G	R	B	G	R	…	B	G	R	B	G	R	
TB=1	TB=0																	
G0	G319	0000H,0000H			0000H, 0001H			0000H, 0010H			…	0000H, 00EEH			0000H, 00EFH			0
G1	G318	0001H,0000H			0001H, 0001H			0001H, 0010H			…	0001H, 00EEH			0001H, 00EFH			1
G2	G317	0010H,0000H			0010H, 0001H			0010H, 0010H			…	0010H, 00EEH			0010H, 00EFH			2
G3	G316	0011H,0000H			0011H, 0001H			0011H, 0010H			…	0011H, 00EEH			0011H, 00EFH			3
G4	G315	0100H,0000H			0100H, 0001H			0100H, 0010H			…	0100H, 00EEH			0100H, 00EFH			4
. . .	. . .	. . .			. . .			. . .			. . .	. . .			. . .			. . .
G316	G3	013CH, 0000H			013CH, 0001H			013CH, 0010H			…	013CH, 00EEH			013CH, 00EFH			316
G317	G2	013DH, 0000H			013DH, 0001H			013DH, 0010H			…	013DH, 00EEH			013DH, 00EFH			317
G318	G1	013EH, 0000H			013EH, 0001H			013EH, 0010H			…	013EH, 00EEH			013EH, 00EFH			318
G319	G0	013FH, 0000H			013FH, 0001H			013FH, 0010H			…	013FH, 00EEH			013FH, 00EFH			319

Horizontal address	0	1	2	…	238	239

Remark : The address is in 00xxH,0yyyH format, where yyy is the vertical address and xx is the horizontal address

10. ABSOLUTE MAXIMUM RATING

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY FOR LOGIC	VDD－VSS	Ta=25℃	-0.3	—	4.0	V
INPUT VOLTAGE	VIN	Ta=25℃	-0.3	—	VDD+0.3	V
OPERATION TEMPERATURE	TOPR	---	- 20	—	70	℃
STORAGE TEMPERATURE	TSTG	---	- 30	—	+80	℃

NOTES:

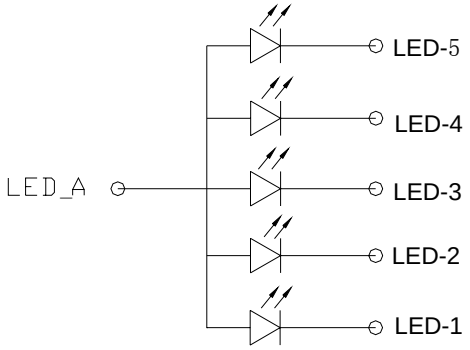
(1) LCM should be grounded during handling LCM.

11. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY VOLTAGE	VDD－VSS	Ta= +25℃	-	2.8	-	V
POWER SUPPLY FOR LCD DRIVING	Vlcd	Ta= +25℃	-	7.8	-	V
INPUT VOLTAGE “H” LEVEL	VIH	—	0.8VDD	—	VDD	V
INPUT VOLTAGE “L” LEVEL	VIL	—	VSS	—	0.2VDD	V
OUTPUT VOLTAGE “H” LEVEL	VOH	IOH=-100uA	0.8VDD	—	VDD	V
OUTPUT VOLTAGE “L” LEVEL	VOL	IOL=100uA	VSS	—	0.2VDD	V

12. LED BACKLIGHT

12-1 POWER SUPPLY FOR LED BACKLIGHT



12-2 ABSOLUTE MAXIMUN RATING

PARAMETER	SYMBOL	SPECIFICATIONS	UNIT
POWER DISSIPATION	PD	350	mW
OPERATION TEMPERATURE	TOPR	-20℃ ～+70℃	℃
STORAGE TEMPERATURE	TSTG	-30℃ ～+80℃	℃

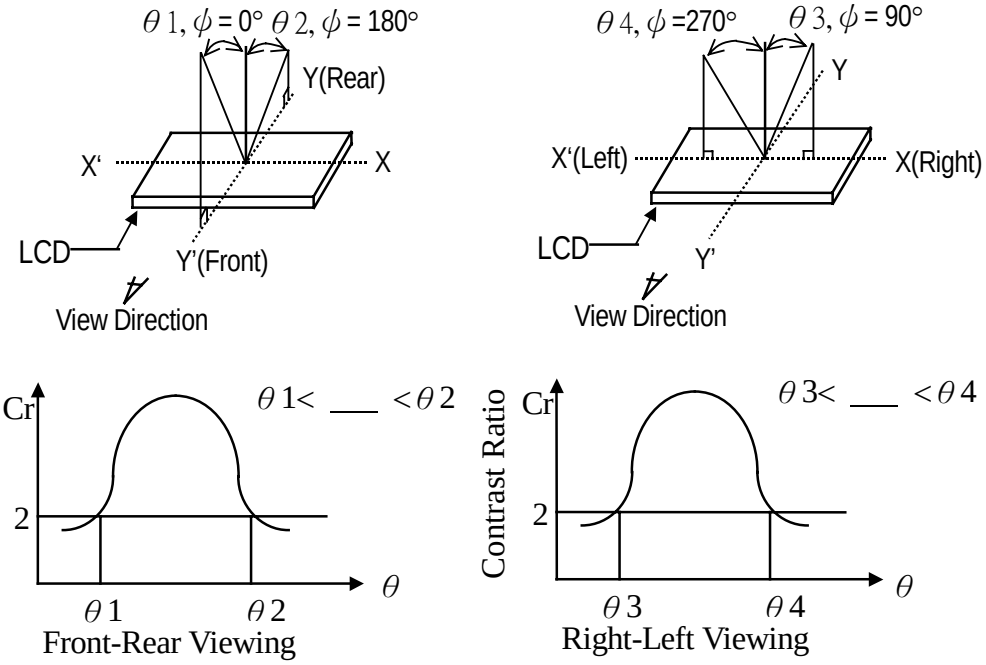
12-3 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	REMARK	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
FORWARD VOLTAGE	VF	If =100MA	3.0	3.2	3.4	V
LUMINOUS INTENSITY	Iv	If =100MA	3000	3200	3500	cd/m2
LUMINOUS TOLERANCE	Iv-m	(min/max)/100	80	—	—	%

13.OPTICAL CHARACTERISTICS

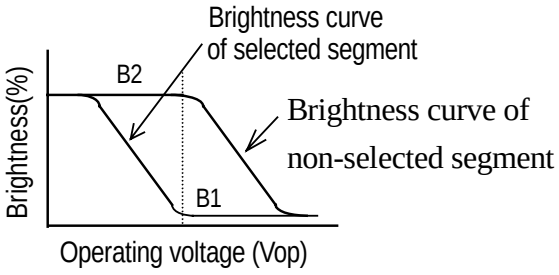
Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance		T%	Viewing normal angle $\theta_X = \theta_Y = 0°$	NA	5.5	NA	%	All left side data are based on CMO's following condition -- Type 767 NTSC: 60% LC: 5091 **Light : C light** (Machine:BM5A) Polarizer without DBEF **Reference Only**
Contrast Ratio		CR		150	250	NA	--	
Response Time		T_R		NA	15	20	ms	
		T_F		NA	35	50	ms	
Chromaticity	Red	X_R		0.608	0.638	0.668		
		Y_R		0.296	0.326	0.356		
	Green	X_G		0.267	0.297	0.327		
		Y_G		0.549	0.579	0.609		
	Blue	X_B		0.104	0.134	0.164		
		Y_B		0.081	0.111	0.141		
	White	X_W		0.285	0.315	0.345		
		Y_W		0.315	0.345	0.375		
Viewing Angle	Hor.	θ_{X+}	Center CR≥10	-	45	-	deg.	
		θ_{X-}		-	45	-		
	Ver.	θ_{Y+}		-	35	-		
		θ_{Y-}		-	15	-		

(1) DEFINITION OF VIEWING ANGLE

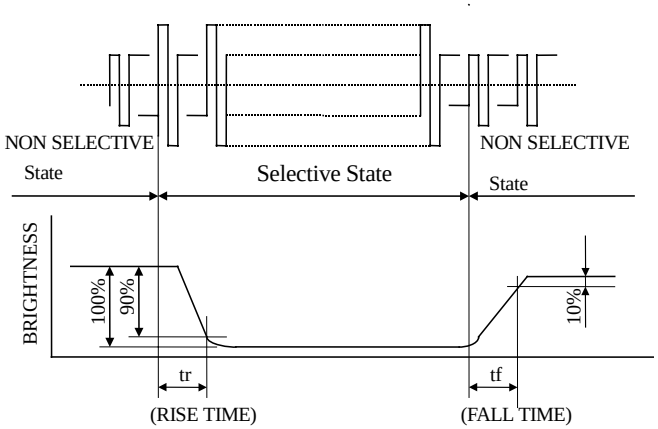


(2) DEFINITION OF CONTRAST

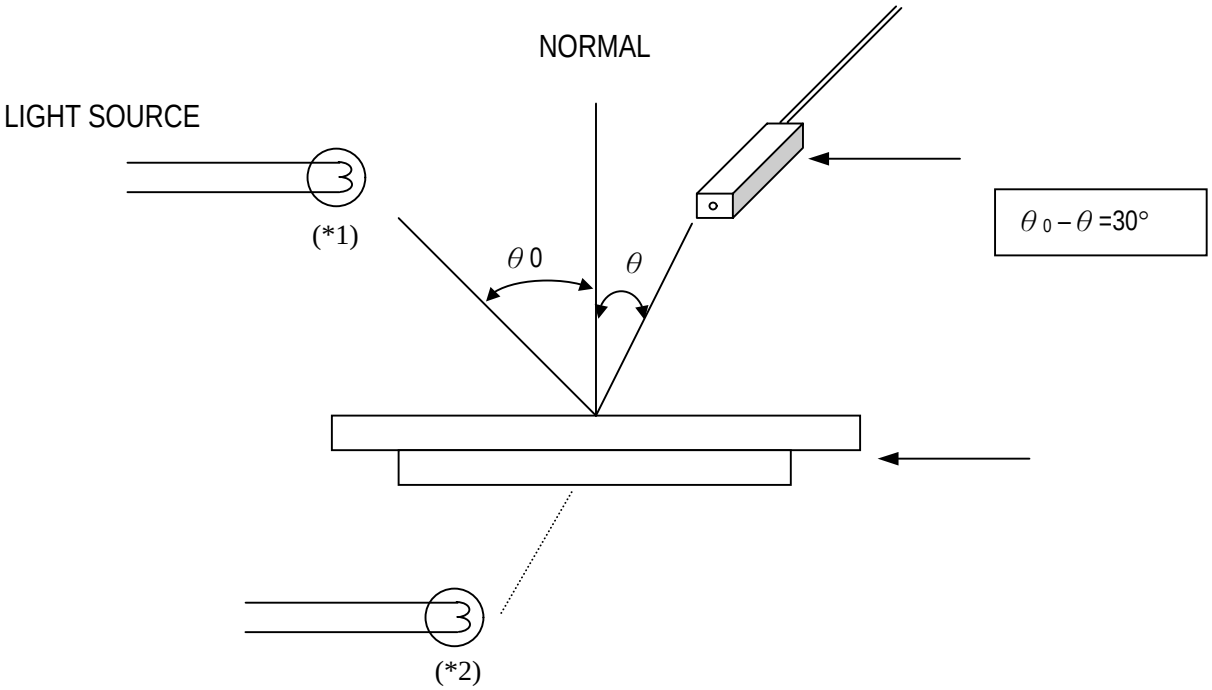
$$C.R = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



(3) DEFINITION OF RESPONSE



(4) MEASURING INSTRUMENTS FOR ELECTRO-OPTICAL CHARACTERISTICS



*1.Light source position for measuring the reflective type of LCD panel

*2.Light source position for measuring the transflective / transmissive types of LCD panel

14. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING TEMPERATURE	TOPR	-20℃～+70℃	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE TEMPERATURE	TSTG	-30℃～+80℃	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
HUMIDITY	—	See Note	WITHOUT CONDENSATION

*NOTE: TEST CONDITION

(1)TEMPERATURE AND HUMIDITY: IF NO SPECIFICATION, TEMP. SET AT 25±2℃, HUMIDITY SET AT 60±5%RH

(2) OPERATING STATE: SAMPLES SUBJECT TO THE TESTS SHALL BE IN " OPERATING" CONDITION

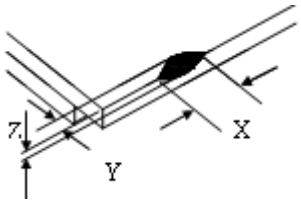
15.RELIABILITY TEST

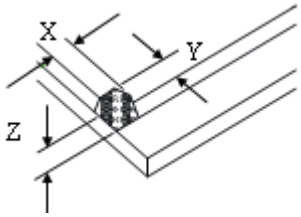
ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERTURE +70℃ 240HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERTURE - 20℃ 240HRS	
STORAGE TEMPERATURE	HIGH TEMPERTURE +80℃ 240HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERTURE - 30℃ 240HRS	
HUMIDITY	40℃ 90%RH 120HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
VIBRATION	• Operating Time: thirty minutes exposure for each direction (X,Y,Z) • Sweep Frequency: 10～55Hz (1 min) • Amplitude: 1.5mm	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
THERMAL SHOCK	-20℃(30mins) ←→+80℃(30mins) 10 cycles	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

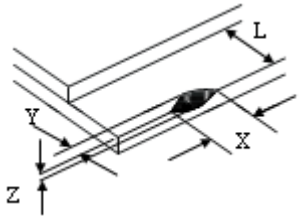
NOTE: The samples must be free from defect before test, must be restore at room condition at least for 2 hour after reliability test before any inspection.

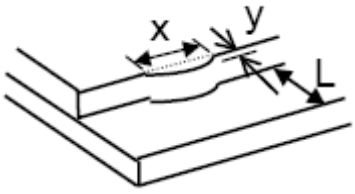
16.THE STANDARD OF INSPECTION

16-1 Inspection items and specification for appearance（power off）

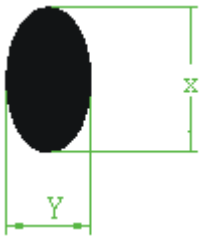
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>1</td><td>Dimension</td><td>Dimension out of the specification</td><td>1.0</td></tr>
<tr><td>2</td><td>Glass crack</td><td>1、General crack
 

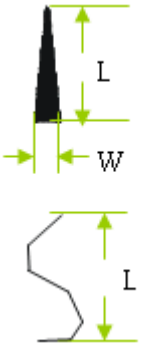
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>Not over A area</td><td>≤T</td></tr>
</table>
2、corner
 

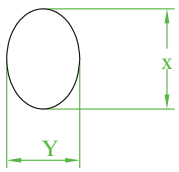
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>Not over A area</td><td>No check</td></tr>
</table>
3、contact pad crack
 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>≥ L/3</td><td>No check</td></tr>
</table>
4、Substrate protuberance and internal crack
 

<table>
<tr><th>X</th><th>Y</th></tr>
<tr><td>≥ K/8</td><td>≥ L/3</td></tr>
</table>
Transfer position crack: ≤L/5</td><td>2.50</td></tr>
</table>

<table>
<tr>
<td>3</td>
<td>Black dot \ White dot</td>
<td>


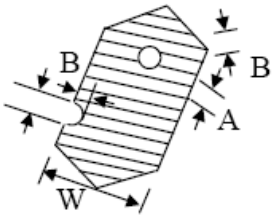
<table>
<tr><td rowspan="2">D</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>D＜0.2</td><td>No check</td><td rowspan="4">No check</td></tr>
<tr><td>0.2≤D＜0.3</td><td>2</td></tr>
<tr><td>0.3≤D≤0.5</td><td>1</td></tr>
<tr><td>D>0.5</td><td>0</td></tr>
</table>
X: long diameter
Y: shot diameter
D: average of diameter D=(X+Y)/2
</td>
<td>2.50</td>
</tr>
<tr>
<td>4</td>
<td>Line defect</td>
<td>


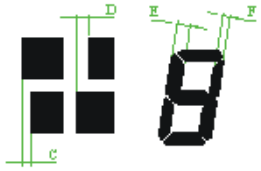
<table>
<tr><td rowspan="2">Length</td><td rowspan="2">Whidth</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>accept</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr>
<tr><td>L≤3</td><td>W≤0.05</td><td>2</td></tr>
<tr><td rowspan="2">L≤2.5</td><td>W≤0.05</td><td>2</td></tr>
<tr><td>W＞0.05</td><td colspan="2">As round type</td></tr>
</table>
L: Length W: Width
Defect of polarizer (Scratches、Spot) : According to the limit specimen
</td>
<td>2.50</td>
</tr>
<tr>
<td>5</td>
<td>Polarizer Bubble</td>
<td>


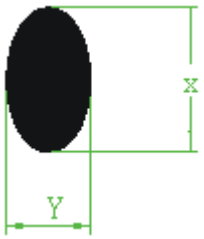
<table>
<tr><td rowspan="2">D</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>D≤0.2</td><td>No check</td><td rowspan="4">No check</td></tr>
<tr><td>0.2≤D≤0.5</td><td>3</td></tr>
<tr><td>0.5≤D≤1.0</td><td>2</td></tr>
<tr><td>D＞1.0</td><td>0</td></tr>
</table>
</td>
<td>2.50</td>
</tr>
<tr>
<td>6</td>
<td>External print of panel</td>
<td>1、 Transfigure、pin hole：same as segment transfinguer
2、 Print width: print width ≥1/2 standard width is acceptable</td>
<td>2.50</td>
</tr>
<tr>
<td>7</td>
<td>Silicon glue</td>
<td>The area of painting silicon glue must cover the ITO circuit.</td>
<td>2.50</td>
</tr>
<tr>
<td>8</td>
<td>Defect of PCB</td>
<td>1、 The char 、wrong edition、bresking off circuit、crack and air-logged orifice are unreceivable for PCB.
2、 gold finger of PCB can not be oxidative、smudgy and broken..</td>
<td>2.50</td>
</tr>
</table>

9	SMT organ	1、 deflexion of component≤1/3width of component 2、 Trying to keep dot of soldering tin orbicular 3、 Damage 、break、wrong assembly and unseal are unreceivable for component.	2.50
10	Steel Frame	1、 Break and distortion are unreceivable for frame. 2、 If there is one nick which can not lead to cast or hole of painting, we allow that following: Length≤5mm;Width≤0.3mm	2.50

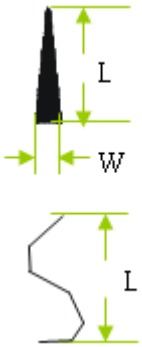
16-2 Inspection items and specification for display defect（power on）

<table>
<tr><td>1</td><td>Electrical Defect</td><td></td><td><table><tr><td>Segment missing</td><td>Not allow</td></tr><tr><td>Segment short</td><td>Not allow</td></tr><tr><td>Non-display</td><td>Not allow</td></tr></table></td><td>1.0</td></tr>
<tr><td>2</td><td>Pin hole</td><td>1、Pin hole
 

<table><tr><td>width</td><td>Acceptable of defect</td></tr><tr><td>W＜0.4</td><td>D≤0.2 & D≤1/2W</td></tr><tr><td>W≥0.4</td><td>D≤0.25 & D≤1/3W</td></tr></table>
* D=(A+B)/2 D≤0.1 acceptable</td><td>2.50</td></tr>
<tr><td>3</td><td>Display pattern</td><td> 

<table><tr><td>Width</td><td>Acceptable of defect</td></tr><tr><td>W＜0.4</td><td>C、D、G≤1/2W</td></tr><tr><td>W≥0.4</td><td>C、D、G≤0.2</td></tr></table>
W: Design dimension C、D: discrepant dimension G=|E-F|</td><td>1.0</td></tr>
<tr><td>4</td><td>Black/white dot</td><td> 

<table><tr><td rowspan="2">D</td><td colspan="2">Acceptable QTY</td></tr><tr><td>A/B Area</td><td>C Area</td></tr><tr><td>D＜0.1</td><td>No check</td><td rowspan="4">No check</td></tr><tr><td>0.1≤D＜0.2</td><td>2</td></tr><tr><td>0.2≤D≤0.25</td><td>1</td></tr><tr><td>D>0.25</td><td>0</td></tr></table>
X: long diameter
Y: shot diameter
D: average diameter D=(X+Y)/2</td><td>2.50</td></tr>
</table>

<table>
<tr>
<td>5</td>
<td>Line defect</td>
<td> 

L: length W: width
<table>
<tr><td rowspan="2">Length</td><td rowspan="2">Width</td><td colspan="2">Acceptable QTY</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>不计</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr>
<tr><td>L≤3</td><td>W≤0.03</td><td>2</td></tr>
<tr><td rowspan="2">L≤2.5</td><td>0.03＜W≤0.05</td><td>2</td></tr>
<tr><td>W＞0.05</td><td colspan="2">Sa round type</td></tr>
</table>
</td>
<td>2.50</td>
</tr>
</table>

17.USING LCD MODULES

17-1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.

(4) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, wipe gently with absorbent cotton or other soft material like chamois soaked in Isopropyl alcohol or Ethyl alcohol. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

(9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).

(10) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(11) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

17-2 PRECAUTION FOR HANDING LCD MODULES

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

(1) Do not alter, modify or change the the shape of the tab on the metal frame.

(2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(3) Do not damage or modify the pattern writing on the printed circuit board.

(4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

(5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(6) Do not drop, bend or twist LCM. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(7) In order to avoid the cracking of the FPC,you should to pay attention to the area of FPC where the FPC was bent .the edge of coverlay;the area of surface of Ni-Au plating,the area of soldering land,the area of through hole.

17-3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM. To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules. - Exposed area of the printed circuit board. - Terminal electrode sections.

(2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.

(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

(5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

(6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

17-4 PRECAUTIONS FOR OPERATION

(1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.

(2) Driving the LCD in the voltage above the limit shortens its life.

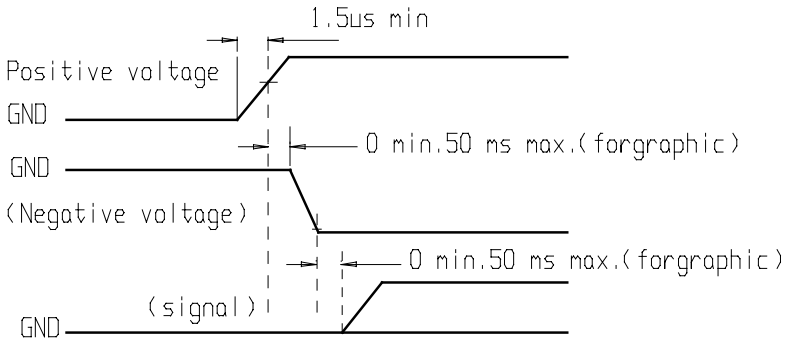
(3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

(4) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

(5) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(6) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.

(7) When turning the power on, input each signal after the positive/negative voltage becomes stable.



17-5 STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)

(4) Environmental conditions :

- Do not leave them for more than 160hrs. at 70°C.
- Should not be left for more than 48hrs. at -20°C.

17-6 SAFETY

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leakes out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

17-7 LIMITED WARRANTY

Unless agreed between SUCCESS and customer, SUCCESS will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with SUCCESS LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to SUCCESS within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of SUCCESS limited to repair and/or replacement on the terms set forth above. SUCCESS will not be responsible for any subsequent or consequential events.

17-8 RETURN LCM UNDER WARRANTY

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.